have lately been granted to local authorities for the promotion of technical education, that it was necessary for the Institute to consider the various ways in which it might hope to meet most effectually the altered conditions. In the following statement it has summed up clearly the main facts of the situation :—

(1) Recent legislation has placed funds at the disposal of County Councils for the purposes of technical education, and has imposed on local authorities the responsibility of determining the best means of utilizing those funds in accordance with the provisions of the Technical Instruction Act.

(2) Whilst the Science and Art Department pays grants on results on all subjects of instruction included in its Directory, no such payments are made by the Department on the technological and trade subjects included in the Institute's programme. Hitherto, grants on such subjects have been paid by the Institute, but these grants will be discontinued after the year 1892.

(3) The Institute is prepared to continue, and to defray the cost of its present system of technological examinations, and to improve it from time to time—

(*a*) By the addition of further practical tests.

(*b*) By adapting the examinations to a still greater extent to local requirements and to the different sections into which many trades are now divided.

(*c*) By the addition of new subjects of examination.

(4) The administration of the present system of examinations involves—

(*a*) The organization of technical classes adapted to different trades.

(*b*) The selection and appointment of competent examiners and local superintendents.

(*c*) Inquiry into the qualifications, and the registration, of teachers.

(*d*) The preparation of syllabuses of instruction and examination.

(*e*) The recommendation, of books of reference, for the use of students and for the formation of technical libraries in connection with separate trades.

(*f*) The examination of registers of attendance of students at classes, and of certificates as to their occupations.

(*g*) The award of different grades of certificates, of silver and bronze medals, and of the money prizes, provided by the separate Livery Companies of London.

(5) The present system of examinations would be further improved by the inspection of classes by competent experts in different branches of trade, and by other persons possessing the necessary scientific knowledge and educational experience. Information might thus be obtained as to the efficiency of the teaching, the provision made for practical instruction in the laboratory or workshop, and the adequacy of the equipment as regards apparatus, models, and machinery. The Institute has under consideration the expediency of organizing such a system of inspection.

(6) The Institute would be prepared to submit to County and Borough Councils co-operating with it, reports on the attendance of students at technological classes, and on the results of the examination of such students, which would serve to guide County Councils in making grants in aid of the maintenance of such classes.

(7) It is suggested that the grants in aid might be of two kinds :—

(*a*) Capitation grants on students in regular attendance at classes certified by the Institute.

(*b*) Grants on the results of the Institute's technological examinations.

(8) No grants have been hitherto given under section (*a*), although the want of such assistance has been generally felt and fully recognized. The grants under section (*b*), given by the Institute, consist of £2, and £1, on behalf of every candidate who takes a first-class or second-class certificate, and is actually engaged in the trade connected with the subject of examination.

(9) The Institute possesses the administrative machinery required for furnishing local authorities with the necessary detailed reports for the award of grants under each of the above sections, and is prepared to place its technical and educational experience at the service of County and Borough Councils for the purpose hereinbefore indicated.

(10) The Institute would be further prepared to make arrangements with County or Borough Councils co-operating with it, for submitting reports on the general efficiency of technological classes, and for affording assistance in the organization of new schools or classes for the promotion of technical education in connection with local trades and industries.

These suggestions are made with the view of indicating the position which the Institute has occupied during the last twelve years, and that which it is prepared to occupy in future, in relation to technical education throughout the country, and of enabling County and Borough Councils, if they so desire, to avail themselves of the assistance thus offered in improving, and in subsidizing, by the payment of grants, the technological and trade classes now established in the chief centres of industry, many of which, it is feared, without such help, will be unable to continue to exist.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

Cambridge.—Sir Alfred C. Lyall, K.C.B., K.C.I.E., has been appointed Rede Lecturer. His subject is "Natural Religion in India."

Prof. Roy announces for the Long Vacation a course of instruction in "Bacteriology," suitable for candidates for the University diploma in public health. Dr. A. Gamgee delivers in this term and the next a course in pathological chemistry.

The Special Board for Medicine have issued revised schedules defining the range of the examinations in physics and chemistry for the M.B. degree. Johns Hopkins University is recognized by the Board as a school of medicine.

SOCIETIES AND ACADEMIES.

London.

Royal Society, February 12.—"On the Demonstration by Staining of the Pathogenic Fungus of Malaria, its Artificial Cultivation, and the Results of Inoculation of the Same." By Surgeon J. Fenton Evans, M.B. Communicated by Prof. Victor Horsley, F.R.S. (From the Laboratory of the Brown Institution.)

The discovery of organisms constantly concomitant with manifestations of malaria was made by Laveran in 1880.

His researches have since been corroborated and amplified by numerous observers in different parts of the world, among whom must be mentioned, Marchiafava Celli, Golgi, and Guarnieri, in Italy ; Councilman, Osler, and James, in America : and Vandyke Carter, in India. The foreign structures which all of the above-named investigators agree in finding in the blood during or after attacks of ague may be grouped into the following classes :—

(1) "Cystic" bodies or spores, 2 to 11 μ in diameter, round, transparent, encapsuled bodies of variable dimensions.

(2) Crescentic bodies, 8 to 9 μ long and 3 μ broad.

(3) Plasmodia malariæ, organisms as variable in size as the "cystic" bodies or spores, possessing the power of amœboid movement, and so closely associated with the red blood corpuscle that hitherto the majority of observers have considered them to be parasites situated within the red blood cells.

(4) Mobile filaments, 21 to 28 μ long.

Despite the general concord of the observations, the subject has not advanced beyond the stage of recognition of these structures in the blood, and that, too, only while in the fresh state.

No method had hitherto been discovered of preparing permanently stained specimens of the organism.

It had never been isolated or classified, nor when thus separated had its pathogenic qualities ever been tested by experiments on lower animals.

It was thus clear that much remained to be done, and in the paper are recounted the attempts made to place the subject on a satisfactory footing. The author has found that it is possible to stain the organisms with an anilinized alkalized solution of rosanilin hydrochloride after treatment with bichromate of potash, and after treatment with dilute sulphuric acid by an anilinized alkalized solution of Weigert's acid fuchsin.

Another method of staining consisted in the saturation of the tissue with a copper salt and its reduction by sulphuretted hydrogen previous to coloration with anilinized alkalized acid fuchsin.

By these staining methods the organisms have been demonstrated in the blood, and also in the tissues. And some new, hitherto unrecognized features are described, among which may be mentioned what appears to be the germination of the spore in the blood, the existence of a comma-shaped body and of mycelium in the spleen and Peyer's glands, and the localization of the plasmode, *i.e.* in relation to the blood corpuscles.

The isolation of the organism and its artificial cultivation have been successfully carried out, and it is shown that this result entirely depends for its success upon the fact that the nutrient media must be previously treated with living blood, *i.e.* before *rigor mortis* has set in.

Alteration in the chemical composition of the nutrient medium, consisting in the addition of glucose, together with iron or hæmoglobin or fresh blood, to the non-peptonized beef broth, elicited the interesting fact that, under these circumstances, the organism can pass to a more highly developed state, displaying the structure and fructification of a highly organized fungus, but differing in certain important features from any fungus hitherto described.

Inoculation of guinea-pigs, monkeys, and rabbits with the growths in various nutrient media has produced a frequently fatal disease, which, although not characterized in these animals by the symptoms of classical intermittent fever, yet displayed in a number of instances a definitely intermittent character. It was further, whatever its clinical character, invariably accompanied by the appearance of the characteristic organisms in the blood drawn after death from the right ventricle.

It is accordingly concluded that the malarial fungus is capable of being cultivated outside the body, and has been proved to possess pathogenic qualities.

Zoological Society, February 17.—Prof. Flower, F.R.S., President, in the chair.—Mr. Edward Gerrard, Jun., exhibited an extraordinarily large head of a Koodoo Antelope (*Strepsiceros kudu*), which had been shot by Mr. F. C. Selous, near the river Macloutsie, Khama's Country, South Africa, in May last.—Mr. T. D. A. Cockerell exhibited and made remarks on a curious and rather noteworthy monstrosity of a Land-shell (*Clausilia rugosa*) with two apertures.—Mr. G. A. Boulenger exhibited and made remarks on the renewed left pectoral fin of an African Lepidosiren (*Protopterus annectens*) from a living specimen in the Society's Gardens.—Mr. Boulenger also exhibited young specimens and eggs of a South African Siluroid fish (*Galeichthys feliceps*), sent to him by Mr. J. M. Leslie, of Port Elizabeth. They had been taken from the mouth of the male parent, which carries its eggs in this extraordinary manner.—Prof. G. B. Howes read a paper on the probable existence of a Jacobson's organ among the Crocodilia, and made observations upon the skeleton of that organ in the Mammalia, and upon the basimandibular elements in the Vertebrata.—Mr. R. H. Burne made some observations on the variation and development of the Leporine sternum.—Mr. Scott B. Wilson read a paper on *Chasiempis*—a genus of Muscicapine birds peculiar to the Sandwich Islands. He described one of the species inhabiting the island of Oahu as new, and named it *Chasiempis gayi*, after Mr. F. Gay, of Kauai. The author further gave a key by which the five species of this genus inhabiting the various islands may be distinguished.—Mr. Wilson also read the description of a new bird of the genus *Himatione*—based on a single specimen obtained on the island of Maui—naming it *Himatione dolii*, after Mr. S. B. Dole, of Honolulu.—Mr. G. A. Boulenger read a paper on some British specimens of the remains of *Homœosaurus*, and made remarks on the classification of the Rhynchocephalia.—Mr. F. E. Beddard read a preliminary account of an Earthworm from West Africa, referable to a new genus and species, which he proposed to call *Libyodrilus violaceus*.—Mr. Frank Finn gave an account of a functional *ductus botalli* which he had observed in specimens of two birds (*Nycticorax violaceus* and *Dafila spinicauda*) dissected in the Society's Laboratory.

Royal Meteorological Society, February 18.—Dr. C. T. Williams, Vice-President, in the chair.—The following papers were read :—The great frost of 1890–91, by Mr. C. Harding. This paper dealt with the whole period of the frost from November 25 to January 22, and it was shown that over nearly the whole of the south-east of England the mean temperature for the 59 days was more than 2° below the freezing-point, whilst at seaside stations on the coast of Kent, Sussex, and Hampshire, the mean was only 32°. In the extreme north of Scotland as well as in the west of Ireland, the mean was 10° warmer than in the south-east of England. In the southern midlands and in parts of the south of England the mean temperature for the 59 days was more than 10° below the average, but in the north of England the deficiency did not amount to 5°, and in the extreme north of Scotland, it was less than 1°. The lowest authentic reading in the screen was 0°·6 at Stokesay, in Shropshire, but almost equally low temperatures occurred at other periods of the frost. At many places in the south and south-west of England as well as in parts of Scotland and Ireland, the greatest cold throughout the period occurred at the end of November ; and at Waddon, in Surrey, the thermometer in the screen fell to 1°, a reading quite unprecedented at the close of the autumn. At Addington Hills, near Croydon, the shade thermometer was below the freezing-point each night, with one exception, and there were only two exceptions at Cambridge and Reading ; whilst in the Shetlands there were only 9 nights with frost, although at Biarritz frost occurred on 31 nights, and at Rome on 6 nights. At many places in England the frost was continuous night and day for 25 days, but at coast stations in the north of Scotland it in no case lasted throughout the 24 hours. On the coast of Sussex the temperature of the sea was about 14° warmer than the air throughout December, but on the Yorkshire coast it was only 6° warmer, and in the Shetlands and on parts of the Irish coast it was only 3° warmer. The Thames water off Deptford, at 2 feet below the surface, was continuously below 34° from December 23 to January 23, a period of 32 days, whilst the river was blocked with ice during the greater part of this time. In Regent's Park, where skating continued uninterruptedly for 43 days, the ice attained the thickness of over 9 inches. The frost did not penetrate to the depth of 2 feet below the surface of the ground in any part of England, but in many places, especially in the south and east, the ground was frozen for several days at the depth of 1 foot, and at 6 inches it was frozen for upwards of a month. In the neighbourhood of London the cold was more prolonged that in any previous frost during the last 100 years, the next longest spell being 52 days in the winter of 1794–95, whilst in 1838 frost lasted for 50 days, and in 1788–89 for 49 days.—The problem of probable error as applied to meteorology, by Mr. T. W. Backhouse.

EDINBURGH.

Royal Society, February 2.—Sir Douglas Maclagan, President, in the chair.—Prof. W. Rutherford, by request of the Council of the Society, gave an address on the sense of hearing. He criticized Helmholtz's theory of the manner in which the cochlea is affected by sound-vibrations, and showed the great anatomical difficulties of any theory that regards the basilar membrane as the transmitter of sound-vibrations to Corti's cells, and as an analyst of complex sound-vibrations. The basilar membrane is heavily damped by the cellular elements above and beneath it ; and, in the case of the rabbit, by its division into two layers with a homogeneous tissue between them, and also beneath the lower layer—an arrangement that must greatly interfere with any localized sympathetic vibration of its fibres. The hair cells of Corti are the true nerve terminations, and are placed in a favourable position for receiving the sound-waves transmitted to them through the superjacent membrane of Corti. The sound-wave is probably considerably damped, and fine vibrations therefore destroyed, by the granular protoplasm at the lower ends of Corti's cells and the granular cement substance between their lower ends and the supporting cells of Deiters. He stated the arguments opposed to the theory of Helmholtz, and explained his own theory of sound-sensation suggested by the telephone, and communicated by him to the British Association in 1885. Although no theory is free from difficulty, he maintained that the most feasible theory is that the great extension of the organ of Corti in the mammal is for the purpose of increasing the number of hair cells, so that the appreciation of qualities of sound may be more acute, and therefore more intelligent; that the hairs of all the cells of Corti are affected by tones of every pitch, and that the sound-vibrations are translated by Corti's cells into nerve-vibrations corresponding in frequency, amplitude, and form to those of the sound ; and that the different sensations of tone are due to nerve-vibrations of different frequency and form, periodic or aperiodic, arriving in the sensorium. He illustrated his address by numerous diagrams and experiments, and was awarded at the close, on the motion of Sir William Turner, a special vote of thanks by the Society.

PARIS.

Academy of Sciences, February 23.—M. Duchartre in the chair.—M. Fremy, in presenting his recently published work on the synthesis of rubies, remarked that he had been able to obtain numerous rhombohedric crystals identical with those found in nature. This result has been obtained, after many trials, by calcining a mixture of aluminium, red lead, and potassium bichromate for several hours in an earthenware crucible.—M. Chauveau presented a work having the title "Le Travail musculaire et l'énergie qu'il représente."—On coloured interference rings, by M. Mascart.—On the isolation of the glycolytic ferment of the blood, by MM. Lépine and Barral.—On the spectrum of *α* Lyræ, by M. H. Deslandres. Some photographs of the spectrum of *α* Lyræ were taken at Paris on the same dates as those taken by Mr. Fowler (*Monthly Notices R.A.S.*, December 1890). M. Deslandres's negatives, however, show K as a single, and not as a double line.—Observations of two new asteroids discovered at Nice Observatory on February 11 and 16, by M. Charlois. The magnitudes of the asteroids are 11·5 and 12 respectively.—Observations of the asteroid discovered by Charlois on February 11, made with the Brunner equatorial of Toulouse Observatory, by M. B. Baillaud. Observations for position were made on February 16 and 18.—Observations of sun-spots, made in 1889 and 1890 with the Brunner equatorial (0·18 metres aperture) of Lyons Observatory, by M. Em. Marchand. The following conclusions are deduced from the observations:—(1) The monthly numbers of groups did not vary much from January 1889 to January 1890; they increased from February 1890, this year presenting a total of 38 groups more than the previous one. (2) The total spotted surface per month varied little from January to August 1889; it then began to diminish, and passed a well-marked minimum in November of the same year. It afterwards increased more or less regularly up to the end of 1890, and in this year presented a total spotted surface of 103·3 thousandths of the area of the visible hemisphere, against 73·4 thousandths in 1889. (3) These facts place the minimum of solar activity in November 1889, a result in conformity with the absence of spots from October 10 to December 4 of the same year. (4) The distribution in latitude of the regions of activity changed completely about the time of minimum activity. Whilst at the beginning of 1889 spots were most frequent in the zone − 10° to + 10°, in 1890 the maximum frequency occurred in the zones 20° to 30° in each hemisphere. What is more, the zones 30° to 40° north and south, in which only nine groups appeared in 1889, included thirty-two groups in 1890. (5) The southern hemisphere contained more active regions than the northern before the minimum (1889); the contrary was the case in 1890.—On the movement of a rectilinear vortex in a liquid contained in a rectangular prism of indefinite length, by M. Andrade.—On the representation of equations with four variables, by M. M. d'Ocagne.—On a class of harmonic surfaces, by M. L. Raffy.—On the compressibility of mixtures of air and hydrogen, by M. Ulysse Lala. The observations show that the compressibility of mixtures of air and hydrogen, in which the proportion of the latter gas varies from 16 to 31 per cent. is intermediate between those of air and hydrogen respectively for small pressures (about 100 cm. of mercury). With larger proportions of hydrogen and higher pressures the mixture appears to be less compressible than hydrogen itself. This interesting fact seems fully proved, for the experiments have been controlled by making a series of measures of the compressibility of single gases.—On the compression of quartz, by M. Monnory.—Direction of luminous vibrations; Fresnel's and Sarrau's systems, by M. E. Carvallo.—On the solubility of potassium bitartrate, by M. Ch. Blarez. It is shown that cream of tartar is completely insoluble at the ordinary temperature in a mixture of 100 parts of alcohol at 20°, 900 parts of water, 4 parts of neutral potassium sulphate, and 2 parts of tartaric acid, but is dissolved if all or part of the neutral sulphate is replaced by the acid sulphate.—On the transformation of the fecula in dextrine by butyric ferment (*Bacillus amylobacter*), by M. A. Villiers.—On normal butylamines, by M. A. Berg. The author has used Hoffmann's method for the preparation of these compounds by acting on normal chloride of butyl with an alcoholic solution of ammonia.—Determination of the form of parts of the sternum of vertebrate animals, by M. Lavocat.—The structure of the pancreas and intra-hepatic pancreas of fishes, by M. Laguesse.—Anatomy of *Cerianthus membranaceus*, by M. L. Faurot.—On the differentiation of the liber in the root, by M. P. Lesage.—On the native silver and the dioptase of the French Congo, by M. E. Jannettaz. Some mineralogical specimens brought from the Congo appear to contain native silver.—On the distribution of sea-salt according to altitude, by M. A. Muntz. According to analyses made by the author, the proportion of sodium chloride in the air decreases with the altitude. This result is easy to understand. Its importance is brought out by analyses of plants, rain-water, and the blood of different animals, which appear to vary in saltness in a similar manner.—M. G. Stefanesco announced the discovery of a manuscript containing an account of a fall of carbonaceous meteorites in 1774.

Brussels.

Academy of Sciences, December 6, 1890.—M. Stas in the chair.—Facts demonstrating the permanence of the dark spots on Venus, and the slowness of their movement of rotation, by M. F. Terby. (See Our Astronomical Column.)—On some mollusks and post-Pliocene fossils found during a voyage up the Congo in 1887, by M. E. Dupont.—On the mollusks found by M. Dupont between the mouth of the Congo and the confluence of the Kassai, by M. Ph. Dautzenberg. The description of the specimens is accompanied by three plates.—Note on the physiology of Branchiostegans, by M. Léon Fredericq.—On the preservation of hæmo-cyanine when isolated from the action of air, by the same author.—Physical observations of the planet Mars in 1890, by M. J. Guillaume. (See Our Astronomical Column.)—On the influence of the exterior temperature on the production of heat in warm-blooded animals, by M. G. Ausiaux. M. Ausiaux has placed guinea-pigs in an Arsonval's calorimeter, submitted them to temperatures comprised between 3° and 32° C., and measured their production of heat for each degree. He finds that the minimum production of heat takes place at a temperature nearly equal to the mean diurnal temperature in spring, viz. 20° C. At temperatures above or below this the production of heat is increased.—New method for the quantitative determination of the quality of bread, flour, albumen, &c., by Dr. J. Barker Smith.

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